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Evaluation of Bt and non-Bt Corn with and without Soil Insecticides for Control of Corn Rootworm

Abstract

The purpose of this study was to evaluate the effectiveness of transgenic corn and soil insecticides, either alone or in combination, for the control of corn rootworm. Evaluation of Bt hybrids included Mycogen brand SmartStax and Herculex XTRA, and Dekalb brand YieldGard VT3. Soil insecticides evaluated were SmartChoice, Aztec, and Counter.

Keywords

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Evaluation of Bt and non-Bt Corn with and without Soil Insecticides for Control of Corn Rootworm

RFR-A10106

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Introduction

The purpose of this study was to evaluate the effectiveness of transgenic corn and soil insecticides, either alone or in combination, for the control of corn rootworm. Evaluation of Bt hybrids included Mycogen brand SmartStax and Herculex XTRA, and Dekalb brand YieldGard VT3. Soil insecticides evaluated were SmartChoice, Aztec, and Counter.

Materials and Methods

The corn was planted in an area that had been planted the previous year with “trap crop.” The seed planted for the trap crop was a mixed-maturity blend with a greater proportion of late-maturing varieties. This trap crop constitutes a favorable environment for adult female rootworm late in the season when other fields are maturing and results in a high abundance of rootworm larvae the following year. The experimental design for this study was a randomized complete block design with four replications. Treatments were two rows wide, and 75 ft long. This study was planted on April 21 at a population of 35,600 seeds/acre. Seeds were pre-bagged and planted with a four row John Deere Max Emerge™ 7100 integral planter that had 30-in. row spacing. Granular insecticide formulations were applied with modified SmartBox metering units mounted on the planter. The SmartChoice-SB 5G, Counter-SB 20G, and Aztec 4.67G insecticide treatments were applied with modified SmartBox™ metering units. These products were applied as ounces per 1,000-row ft. The commercial

SmartBox™ was removed from their large-base containers and sandwiched between a flat metal plate on the bottom and a threaded plastic cap on the top. These metering units were connected to the planter’s furrow tubes. The Aztec 2.1G insecticide treatments were applied with modified Noble® metering units mounted on the planter.

A total of twenty roots were dug from each two-row treatment. Roots were evaluated for rootworm feeding injury on the Iowa State Node-Injury Scale (0–3). The number of plants in 17.5-row ft was taken early in the growing season. Lodging counts were taken at harvest time along with final stand count numbers. Each two row treatment was machine harvested. Weights were converted to bushels/acre of No. 2 shelled corn (56 lb/bushels) at 15.5 percent moisture.

Results and Discussion

The three isoline treatments (checks) had significantly higher node injury and lower product consistency than the other treatments (Table 1). Average stand counts are shown in Table 2. Percent lodging was significantly higher for the three isoline treatments (checks) and the Mycogen isoline with Aztec-SB insecticide applied (Table 3). Differences in yield were observed among hybrids and are detailed in Table 4.

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The 2010 Insecticide and Plant-Incorporated Protectants field evaluation report is available on-line at www.ent.iastate.edu.

Table 1. Average root-injury and product consistency for evaluation of insecticide treatments and plant-incorporated protectants. Yield study: Nashua, IA 2010¹.

Treatment ^{2,3}	Form.	Rate ⁴	Placement	Node-injury ⁵	Product consistency ^{6,7}
My-HXT ² + SmartChoice-SB	5G	0.18	Furrow	0.00a	100a
YGVVT3 + Aztec	2.1G	0.14	Furrow	0.01ab	100a
My-HXT ²	-----	-----	-----	0.02ab	100a
YGVVT3 + Aztec	2.1G	0.14	T-Band	0.02abc	100a
My-HXT ² + Counter-SB	20G	0.90	Furrow	0.02abc	100a
My-SSX	-----	-----	-----	0.03abcd	100a
My-HXT ¹	-----	-----	-----	0.06 bcd	100a
YGVVT3	-----	-----	-----	0.08 cd	100a
My-Iso + Aztec-SB	4.67G	0.14	Furrow	0.10 d	100a
DeKalb-Iso	-----	-----	-----	1.80 e	0 b
My-Conv	-----	-----	-----	2.09 ef	0 b
My-Iso	-----	-----	-----	2.20 f	0 b

¹Planted April 21, 2010; evaluated August 4, 2010.²My-SSX = Mycogen Smartstax (Mycogen 2D692); My-HXT¹ = Mycogen brand Herculex XTRA (Mycogen X20625); My-Conv = Mycogen brand Conventional (Mycogen X29624); YGVVT3 = YieldGard VT Triple (DKC61-69); DeKalb-Iso = DeKalb brand RR Isoline (DKC 61-72); My-HXT² = Mycogen brand Herculex XTRA (Mycogen 2T789); My-Iso = Mycogen brand Herculex I (Mycogen 2T783).³My-Iso (Mycogen 2T783) is the isoline of My-HXT² (Mycogen 2T789).⁴Insecticide listed as ounces a.i. per 1,000 row-ft.⁵Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).⁶Product consistency = percentage of times nodal injury was 0.25 (¼ node eaten) or less.⁷Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).**Table 2. Average stand counts for evaluation of insecticide treatments and plant-incorporated protectants. Yield study: Nashua, IA 2010¹.**

Treatment ^{2,3}	Form.	Rate ⁴	Placement	Stand count ^{5,6}
YGVVT3	-----	-----	-----	35.25a
DeKalb-Iso	-----	-----	-----	35.25a
YGVVT3 + Aztec	2.1G	0.14	T-Band	35.25a
My-HXT ¹	-----	-----	-----	35.00a
YGVVT3 + Aztec	2.1G	0.14	Furrow	34.75a
My-Conv	-----	-----	-----	34.50a
My-Iso + Aztec-SB	4.67G	0.14	Furrow	34.25a
My-SSX	-----	-----	-----	34.00ab
My-Iso	-----	-----	-----	33.50abc
My-HXT ² + SmartChoice-SB	5G	0.18	Furrow	33.50abc
My-HXT ²	-----	-----	-----	31.75 bc
My-HXT ² + Counter-SB	20G	0.90	Furrow	31.50 c

¹Planted April 21, 2010; evaluated May 28 and October 7, 2010.²My-SSX = Mycogen Smartstax (Mycogen 2D692); My-HXT¹ = Mycogen brand Herculex XTRA (Mycogen X20625); My-Conv = Mycogen brand Conventional (Mycogen X29624); YGVVT3 = YieldGard VT Triple (DKC61-69); DeKalb-Iso = DeKalb brand RR Isoline (DKC 61-72); My-HXT² = Mycogen brand Herculex XTRA (Mycogen 2T789); My-Iso = Mycogen brand Herculex I (Mycogen 2T783).³My-Iso (Mycogen 2T783) is the isoline of My-HXT² (Mycogen 2T789).⁴Insecticide listed as ounces a.i. per 1,000 row-ft.⁵Means based on 16 observations (2-row trt × 17.5 row-ft/treatment × 4 replications × 2 evaluations).⁶Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).

Table 3. Average percent lodging for evaluation of insecticide treatments and plant-incorporated protectants. Yield study: Nashua, IA 2010¹.

Treatment ^{2,3}	Form.	Rate ⁴	Placement	Lodging ^{5,6} %
My-SSX	-----	-----	-----	0a
YGVVT3 + Aztec	2.1G	0.14	T-Band	0a
My-HXT ¹	-----	-----	-----	1a
YGVVT3	-----	-----	-----	1a
YGVVT3 + Aztec	2.1G	0.14	Furrow	2a
My-HXT ² + Counter-SB	20G	0.90	Furrow	3a
My-HXT ²	-----	-----	-----	7a
My-HXT ² + SmartChoice-SB	5G	0.18	Furrow	9a
My-Conv	-----	-----	-----	26 b
My-Iso + Aztec-SB	4.67G	0.14	Furrow	31 b
DeKalb-Iso	-----	-----	-----	48 b
My-Iso	-----	-----	-----	54 b

¹Planted April 21, 2010; evaluated October 7, 2010.²My-SSX = Mycogen Smartstax (Mycogen 2D692); My-HXT¹ = Mycogen brand Herculex XTRA (Mycogen X20625); My-Conv = Mycogen brand Conventional (Mycogen X29624); YGVVT3 = YieldGard VT Triple (DKC61-69); DeKalb-Iso = DeKalb brand RR Isoline (DKC 61-72); My-HXT² = Mycogen brand Herculex XTRA (Mycogen 2T789); My-Iso = Mycogen brand Herculex I (Mycogen 2T783).³My-Iso (Mycogen 2T783) is the isoline of My-HXT² (Mycogen 2T789).⁴Insecticide listed as ounces a.i. per 1,000 row-ft.⁵Means based on eight observations (2-row trt × 17.5 row-ft/treatment × 4 replications).⁶Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).**Table 4. Average yield for evaluation of insecticides treatment and plant-incorporated protectants. Yield study: Nashua, IA 2010¹.**

Treatment ^{2,3}	Form	Rate ⁴	Placement	Bushels/ acre ^{5,6}
YGVVT3 + Aztec	2.1G	0.14	T-Band	226a
YGVVT3	-----	-----	-----	221a
YGVVT3 + Aztec	2.1G	0.14	Furrow	213ab
My-HXT ² + SmartChoice-SB	5G	0.18	Furrow	203ab
My-HXT ²	-----	-----	-----	199abc
My-HXT ² + Counter-SB	20G	0.90	Furrow	197abc
My-SSX	-----	-----	-----	187 bcd
DeKalb-Iso	-----	-----	-----	186 bcd
My-Iso + Aztec-SB	4.67G	0.14	Furrow	185 bcd
My-HXT ¹	-----	-----	-----	184 bcd
My-Iso	-----	-----	-----	172 cd
My-Conv	-----	-----	-----	161 d

¹Planted April 21, 2010; machine harvested October 13, 2010.²My-SSX = Mycogen Smartstax (Mycogen 2D692); My-HXT¹ = Mycogen brand Herculex XTRA (Mycogen X20625); My-Conv = Mycogen brand Conventional (Mycogen X29624); YGVVT3 = YieldGard VT Triple (DKC61-69); DeKalb-Iso = DeKalb brand RR Isoline (DKC 61-72); My-HXT² = Mycogen brand Herculex XTRA (Mycogen 2T789); My-Iso = Mycogen brand Herculex I (Mycogen 2T783).³My-Iso (Mycogen 2T783) is the isoline of My-HXT² (Mycogen 2T789).⁴Insecticide listed as ounces a.i. per 1,000 row-ft.⁵Means sharing a common letter do not differ significantly according to Ryan's Q Test ($P \leq 0.05$).⁶Yields converted to 15.5 percent moisture.